PRACTICAL MECHANISM.

NUMBER IX.

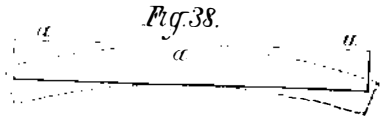
BY JOSHUA ROSE.

VISE WORK—PENING.

The operation termed pening is stretching the skin on one side of work to alter its shape, the principle of which is that, by striking metal with a hammer, the face of the metal struck stretches, and tends to force the work into a circular form, of which the part receiving the effect of the hammer is the outside circle or diameter.

Fig. 38 represents a piece of flat iron, which would, if it

Fig. 38.



were well hammered on the face, *a*, *a*, *a*, with the pene of a hammer, alter its form to that denoted by the dotted lines.

Fig. 39.

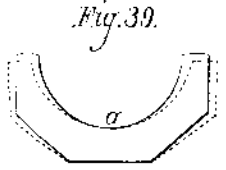
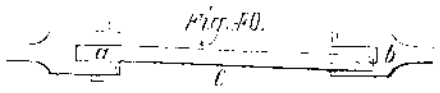


Fig. 39 represents a brass which, if struck with a hammer (along its bore at *a*) or other piece of metal for driving it in while fitting, would gradually assume the form denoted by the dotted lines.

Fig. 40 represents a rod connected at the end, *a*, with a double eye and pin, and requiring to descend true so as to fit into the double eye, *b*, at the other end; if, therefore, it is pened perpendicularly on the

Fig. 40.



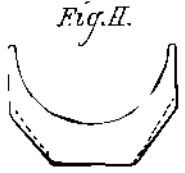
face, *c*, of the rod, the stretched skin will throw the end around so that it will come fair with the eye, *b*. Connecting rod straps which are a little too wide for the rod ends may be in like manner closed so as to fit by pening the outside of the crown end, or, if too narrow, may be opened by pening the inside of the crown end; but in either case the ends of the strap alter most in consequence of their lengths, and the strap will require refitting between its jaws.

Piston rings may be made of larger diameter by pening the ring all round on the inside, and there are many other uses to which pening may be used to advantage, such as setting frames, refitting old work, taking the twist out of work, etc., but it must be borne in mind that if, after a piece of metal has been pened, a cut is taken off it, it will return to its original shape, as the effects of the pening do not extend more than $\frac{1}{64}$ of an inch in depth. When, therefore, a brass or other work requiring to be bored is driven in and out by a piece of metal or a hammer, it stretches the skin; and when the brass is bored, the stretched skin being cut away, it assumes its original shape and hence becomes slack or loose in the strap or block. A light hammer having a round pene should be used; and light blows should be employed for pening, as they are the most effective.

FITTING BRASSES TO THEIR BOXES.

The pattern for a brass which is hexagonal upon the bottom or bedding part should not be made of exactly the same shape as the hexagonal part of the box upon which it beds, because the brass, in casting, shrinks in the direction of the diameter of the bore to such an extent as seriously to alter the angles of the bottom of the brass as compared with the angles on the bottom of the pattern. To compensate for this change of form, the angles on the sides of the pattern should be made more obtuse than those on the sides of the box, as described in Fig. H, the dotted lines being the angle of the box. The shrinkage referred to is not merely that due to the contraction of the metal in cooling, but is an alteration of form which takes place in all castings of more or less segmental circular form, especially in the case of light castings. In castings of 4 inches or less diameter, the rapping (given by the molder to the pattern to loosen it in the sand, so as to be able to extract the pattern without damaging the mold) is about equal to this alteration of form; but in larger castings an allowance must be made for it.

Fig. H.

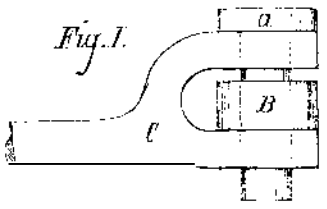


In fitting a brass to its box, first fit the sides of the brass to the box, keeping them at an equal angle to the joint or top face of the brass, so as to let the brass down evenly and not with one side or one bevel lower than the other. To find if the brass is level, use inside callipers as a gage, applied from the top face of the brass to the top face of the box. When the brass is let down so that it approaches the bottom of the box, rub upon the bed of the box a coating of marking; and then upon the end of each bevel, and upon the bottom and near each corner (of the bevels and bottom), place some small pellets of red lead, mixed stiffly; then when the brass is driven home upon its bed and again taken out, the pellets of red lead will adhere to the box because of the marking, and (by their respective thicknesses) denote how nearly the angles or bevels of the brass fit to the box; because where the brass touches the bed of the box, the pellets will be smashed; but if the pellets are intact, it demonstrates that there is space between the box and the brass. It is obvious that the brass requires chipping in those places where the pellets are crushed, and in proportion to the thickness of the pellets that are the least crushed. The pellets should be removed and replaced each time before driving the brass home, and removed when they appear of even thicknesses, the fitting being completed with marking only. All brasses must be fitted to their boxes more tightly than they are intended, when finished, to be, because they go in from the process of boring and are consequently an easier fit after than before being bored.

FITTING LINK MOTIONS.

The planing and boring of the link, of the die, and of the eccentric rod double eyes being completed, the faces of the links may be filed up to a surface plate. The slot of the link should then be filed out to a gage of sheet iron of the proper sweep, the sides of the slot being kept square at all parts with the face of the link: each end of the slot at the termination of the stroke of the die should be eased off a little, so that, when the link and the die are hardened, the latter will not bind hard in the ends of the former, as would otherwise inevitably be the case. The die may then be fitted, to a rather tight fit, to the slot of the link, putting a very light coat of marking upon either or both of them, which will serve as a lubricant to prevent them from cutting, and will show the high spots upon both the link and the die, which spots must be eased off until the die fits to a working fit, providing the link and die are not intended to be hardened. If, however, they are to be hardened, the die must be made of a somewhat easier fit to allow for the expansion of the metal, which takes place in hardening. To fit the double eyes (that is, the eccentric rod ends) upon the link (or quadrant), a bolt and washer should be provided, the pin being a fit to the hole in the eye and to the hole in the washer, the head of the pin and the washer being the finished diameter of the outside of the eye. The end of the pin is passed through one side of the eye, then through the washer, and

Fig. I.

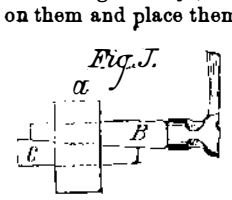


then through the other side of the eye, as illustrated in Fig. I, *a* being the pin, B, the washer, and C, the double eye.

The underneath faces of the pin and washer will, if revolved by hand, mark the two faces (against which they bear) true with the hole of the double eye; and when those faces are finished, the pin may be turned end for end, and the other two faces trued in the same manner. The object of making the head of the pin and the washer of the same diameter as the double eye is that they may be used as gages to which to file up the outside of the double eye, for which purpose they should be hardened so that the file will not cut them. The double eyes being filed to fit the link, the washer (having been used, as above described, as a gage to keep the faces true to the hole) must then be clamped to the link, care being taken to make the hole of the link as true as possible with the hole of the double eye, and to slacken the bolt of the clamp if the double eye requires moving to come fair with the hole in the link. If the clamp were not slacked, striking the double eye to move it would probably spring one jaw out of true with the other. A hand reamer may be passed through the double eye, taking out a light cut, and thus making the holes through the link and double eye parallel and quite true with each other.

If, after the link has been hardened, the die is of too tight a fit, place oil and fine emery in the slot, put the die in its place and (with a piece of wood, through the hole of the die) force it back and forth from end to end of the slot, or in such parts only as it may be too tight; this will grind out the tight places. If the link is tight at the extreme ends, as is sometimes the case, a piece of flat copper shaped and used as a file may be used with grain emery and oil to grind out such ends. If, however, the link has altered so much as to make the grinding a long and tedious operation, it may be opened by placing a bolt and nut in such a position in the slot that the head of the bolt will rest against one side and the end face of the nut against the other side of the slot; the head of the bolt should then be held stationary with a wrench or spanner, and the nut, being unscrewed, will force open the link. Another method is to take two keys, such as connecting rod keys, both having an equal amount of taper on them and place them in the slot of the link as here shown,

Fig. J.



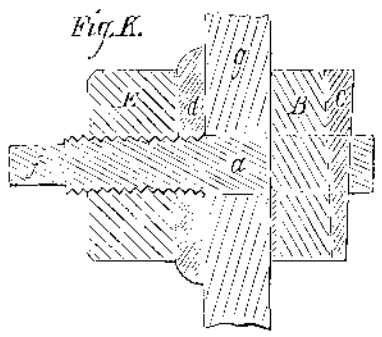
a being an end view of the link, and B and C the keys referred to. The operation is to place a hammer against the head of one key, as here shown, to prevent it from driving out of the link, and to drive in the other key. The advantage of this method over the screw and nut is this: The link will spring considerably before it will alter its form, so that, when applying the bolt and nut, it is difficult, in the second operation (providing the first has not effected the desired opening of the link), to find exactly how much to unscrew the nut. In using the keys, however, lines may be drawn across the keys to denote exactly how far they were driven in during the first operation, which lines will guide the judgment as to how far to drive them in the second operation. If a link opens, that is, if the slot becomes wider during the process of hardening, it may be closed by clamping, or even by a strong vise.

FITTING CYLINDERS.

A casual cylinder or pair of cylinders (there being no templates for marking the holes, etc.,) should be fitted up as follows: If that part of the cylinder cover which fits into the cylinder has a portion cut away to give room for the steam to enter (as is usually the case), mark a line across the inside flange of the cover, parallel to the part cut away, and then scribe each end of the line across the edge of the flange. Then mark a similar line across the cylinder end, parallel to the steam port where it enters the cylinder, and scribe each end of this line across the cylinder flange, so that, when the cylinder cover is placed into the cylinder and the lines on the flanges of the cylinder and the cover are placed parallel to each other, the piece cut away on the cover will stand exactly opposite to the steam port, as it is intended to do. The cover may then be clamped to the cylinder, and holes of the requisite size for the tap (the tapping holes, as they are commonly called) may be drilled through the cover and the requisite depth into the cylinder at the same time. Concerning the correct size of a tapping hole in cast iron, as compared to the tap, there is much difference of opinion and practice. On the one hand, it is claimed that the size of the tapping hole should be such as to permit of a full thread when it is tapped; on the other hand, it is claimed that two thirds or even one half of a full thread is all that is necessary in holes in cast iron, because such a thread is, it is claimed, equally as strong as a full one, and much easier to tap. In cases where it is not necessary for the thread to be steamtight, and where the depth of the thread is greater by at least $\frac{1}{8}$ inch than the diameter of the bolt or stud, three quarters of a full thread is all that is necessary, and can be tapped with much less labor than would be the case if the hole were small enough to admit of a full thread, partly because of the diminished duty performed by the tap, and partly because the oil (which should always be freely supplied to a tap) obtains so much more free access to the cutting edges of the tap. If a long tap is employed to cut a three quarter full thread, it may be wound continuously down the hole, without requiring to be turned backwards at every revolution or so of the tap, to free it from the tap cuttings or shavings, as would be necessary in case a full thread were being cut. The saving of time in consequence of this advantage is equal to at least 50 per cent in favor of the three quarter full thread.

The cylinder covers must, after being drilled, as above, be taken from the cylinder, and the clearing drill put through the holes already drilled so that they will admit the bolts or studs, the clearing holes being made $\frac{1}{16}$ inch larger than the diameter of the bolts or studs. The steam chest may be either clamped to the cylinder, and tapping holes drilled through it and the cylinder (the same as done in the case of the covers), or it may have its clearing holes drilled in it while so clamped, care being taken to let the point of the drill enter deep enough to pass completely through the steam chest, and into the cylinder deep enough to cut or drill a countersink nearly or quite equal to the diameter of the drill. If, however, the steam chest is already drilled, it may be set upon the cylinder, and the holes marked on the cylinder face by a scriber or by the end of a piece of wood or of a bolt, which end may be made either conical or flat for the purpose, marking being placed upon it; so that, by putting it through the hole of the chest, permitting it to rest upon the cylinder face (which may be chalked so as to show the marks plainly), and then revolving it with the hand, it will mark the cylinder face. This plan is generally resorted to when the holes in the chest are too deep to permit of being scribed. To true the back face, round a hole against which face the bolt head or the face of the nut may bed, (in cases where such facing cannot be done by a pin countersink or a cutter used in a machine), the appliance here

Fig. K.



shown may be employed, *a* being a pin provided with a slot at one end to admit the cutter, B, which is held fast by the key, C, and is also provided with a square end, *f*, by which it may be turned or revolved by means of a wrench, and with a thread to receive the nut, E, *d* being a washer; so that, by screwing up the nut, E, the cutting edges of the cutter are forced against the cylinder, *g*, and will, when revolved, cut the face, against which they are forced, true with the hole in the cylinder through which the pin, *a*, is passed.

RICH beds of magnetic ore have been developed in the southwestern portion of Bethlehem Township, Hunterdon County, N. J. The ore is of uniform and excellent quality, containing as impurities manganese, alumina, silica, and lime, being free from sulphur and phosphorus. It is well adapted for making Bessemer steel, and is used by the Bethlehem Iron Company, and the Pennsylvania Steel Works at Harrisburg.

LEAD POISONING.—MM. G. Bergeron and L. L'Hote state that twenty-six persons in the department Seine-et-Marne were attacked with symptoms which were at first ascribed to bilious typhoid fever, but were subsequently traced to lead poisoning. The lead was found in the brine used for salting butter, where it was present as chloride. Two of the cases proved fatal. A notable quantity of lead was found in the intestines, the liver, and the brain of the dead.

Contributions to the Early History of Steam Navigation.

On the 9th of February, 1811, letters patent of the United States, No. 25, were granted to Robert Fulton of New York, for "constructing boats or vessels which are to be navigated by the power of steam engines." The State department at Washington has had occasion recently to make searches among its archives for records pertaining to the early patents, and among the curiosities thus brought to light is a letter from Robert Fulton, bearing date of New York, May 25, 1812, in which he requests Mr. Monroe, then Secretary of State, to give a positive order that his patents for steam boats should not be copied or examined except in case of disputes in law between him and other persons, of which, he says, there were none at the time; and intimates that the doing so enables speculators to contrive, not real improvements, but means of evasion, to the ruin of useful inventions.

Two letters of Henry Spencer have also been found, one bearing date of Albany, August 3, 1798, and the other of Albany, September 3, 1798, both accompanied by drawings and written descriptions of an invention, which he claims to have made, on boats made use of in inland lock navigation, and which may be applicable, he says, to the navigation of the great seas, and of a screw and other means of propulsion to such boats.

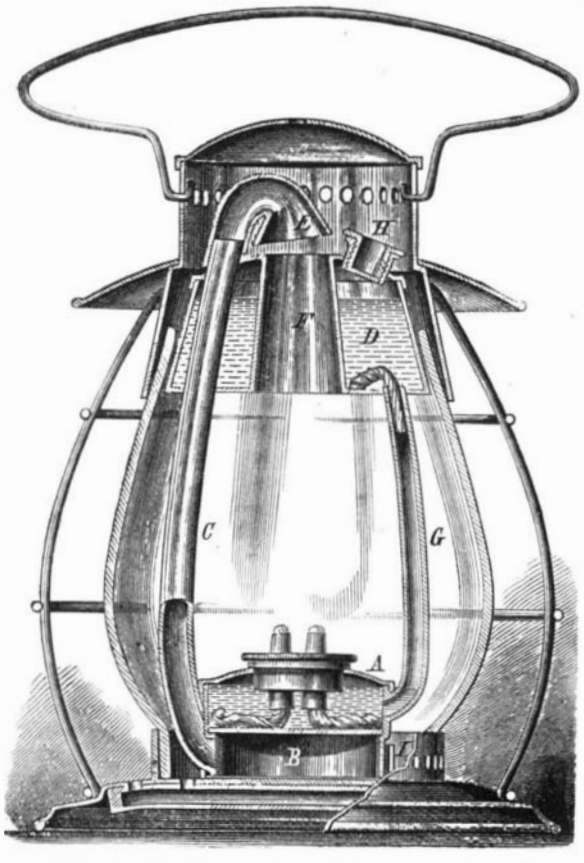
Measurement of the Chemical Action of Solar Light.

Dr. T. L. Phipson, F. C. S., in a note to the *Chemical News*, says: Many years ago I made some experiments on this subject in Paris, and described a method which I believe capable of giving more accurate results than any hitherto obtained. Having discovered that a colorless solution of molybdate of ammonia in sulphuric acid became greenish blue when exposed to the sun, and colorless again during the night, and that the amount of chemical action exerted to produce this tint may be accurately determined by a dilute solution of permanganate of potash, it suffices to operate always upon the same quantity of substance, and to expose it to the light for the same period of time, and in every respect in the same conditions, in order to possess a perfectly accurate process by means of which the problem of the chemical intensity of solar light may some day be solved in a completely satisfactory manner.

LORDON'S IMPROVED LANTERN.

The lantern herewith illustrated is constructed so that the heated air from the flame passed up through an oil reservoir, and thence is conducted down below the wick chamber, the object being to heat the oil in the latter, and thus afford a clearer and brighter light.

The wick chamber is represented at A, below which is another compartment, B, from which extends the tube, C upward inside the glass globe, through the oil reservoir, D and finally terminates in a funnel, E, over the pipe, F through which the hot air from the flame rises. Oil is supplied to the wick chamber by the tube, G, in the upper portion of which is a piece of wick which may be adjusted from the filling orifice, H, to allow the oil to flow to the wick chamber faster or slower, as may be desired. It will be observed that the tube, C, conducts the hot air down under the wick chamber, thus warming the oil in the latter. At the



base of the lantern is a series of holes connecting with the hollow space, I, for purposes of ventilation.

Patented through the Scientific American Patent Agency, July 14, 1874. For further particulars address Daniel Lordon, Fremont Center, Mich.

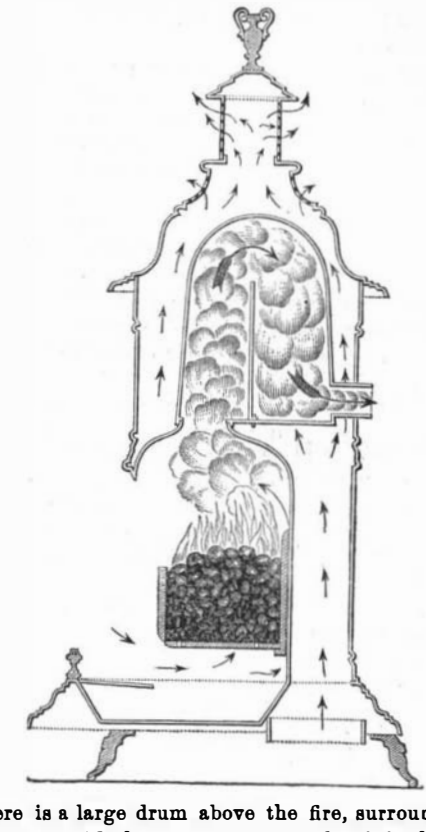
THE recent eruption of Mount Etna was predicted by Professor Silvestri, who has made a special study of such phenomena.

THE FIRE ON THE HEARTH.

While it has been and still is our general rule to decline the publication of engravings of stoves in our editorial columns, we believe it to be to the interest of our readers that our regulation in the present instance should be suspended. We make this exception on account of both the

novelty and the unquestionable merit of the heating apparatus to which the above appropriate name has been given. As regards the mechanical construction of the stove, little need be said, since it is plainly represented in the sectional view, Fig. 2, while the exterior appearance is shown in Fig.

Fig. 2.



1. There is a large drum above the fire, surrounded by a jacket so arranged that a constant supply of fresh air may be continuously brought into contact with greatly expanded surfaces, which absorb the maximum quantity of heat, and impart it rapidly to the inflowing currents, thus preventing overheating, and at the same time supplying the room with an abundant, genial, and invigorating atmosphere. It will be observed from the sectional engraving that two distinct currents pass through the stove. One enters beneath the grate, ascends to the chamber above, passes over the diaphragm therein, and thence goes to the chimney, furnishing the draft. The other enters under the stove, and becomes heated by contact with the hot surfaces; and rises through the jacket, thus compelling a constant circulation through the latter. The fire is entirely open, so that a large supply of additional heat is radiated therefrom. The construction, evidently, is such that there is no opportunity for leakage of the deadly carbonic acid; nor is there any contact of highly heated plates with the air of the room to generate carbonic oxide. Purity of the air—which is the most important requirement—being thus insured, the maintenance of proper circulation is provided for, as already described, so that the stove becomes an efficient ventilator, constantly changing the atmosphere, while distributing at the same time, throughout all parts of the apartment, a moderately warmed, fresh current. In this last respect its advantage over the ordinary open grate in the mantel will be obvious, not only in point of better utilization of the fuel and consequent economy in the same, but in the fact that the old objection to grates, of "roasting the face while the back is freezing," is effectually done away with.

In addition to the advantages which we have enumerated are those of simplicity, there being no intricate flues to become clogged and foul, no dampers to get out of order, and no grate set far into the interior, to dump or clean which is a constant aggravation. The latter is easily shaken, and clinkers readily removed.

It will not require the complimentary testimonials, which the manufacturers submit, from Mr. Lewis W. Leeds (than whom no engineer has more carefully studied the subject of ventilation and warming) and other excellent authorities to demonstrate the value of the invention. It will be a veritable blessing in schools, churches, factories, and all similar apartments where large numbers of people are confined, for lengthy periods of time, for study or work.

Patented by Mr. W. L. Phillips, July 13, 1874. For further particulars, address the Open Stove Ventilating Company, 107 Fulton street, New York city.

Detection of Fuchsin Adulterations.

It has become quite common for French wine merchants and confectioners to use fuchsin to highten the color of their wares. The poisonous properties of this substance have been repeatedly demonstrated, so that, in addition to its being a mere adulteration, its consumption in other substances is directly detrimental to health.

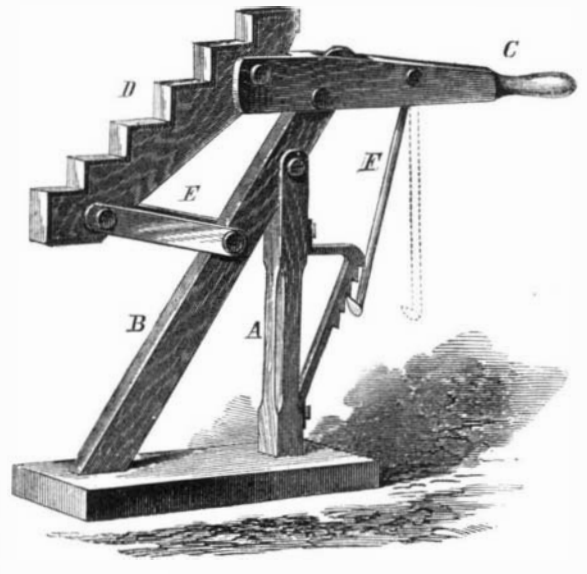
The presence of the substance can be readily recognized in the following manner: Place about 1½ ounces of the suspected compound in a vial, and treat first with 150 grains of subacetate of lead, and then with 300 grains of amylic alcohol. If, after agitating the mixture, the alcohol which separates appears colorless, no fuchsin is present; if the alcohol is colored red, the reverse is the case.

ROWLAND'S WAGON JACK.

The annexed engraving represents a simple and inexpensive form of wagon or lifting jack, which is applicable to all kinds of vehicles.

The upright standard, A, supports an inclined bar, B, both being secured to a substantial base piece. To the upper extremity of the bar, B, is pivoted the lever, C, the forward end of which is similarly attached to the notched bar, D. The lower portion of the latter connects with the bar by means of the pivoted connecting bars, E. To the lever, C, is pivoted the rod, F, the lower end of which is hook-shaped, to engage in the teeth of the bent ratchet bar, shown attached to the rear side of the standard, A.

In using the jack, the free end of the lever, C, is raised and the machine is moved forward until the axle of the wagon rests in one of the notches of bar, D. The lever is then carried down until the load is raised to the desired hight. The hook, F, is next swung forward from the position indicated by the dotted lines in the engraving, and caused to engage upon one of the teeth of the ratchet bar, thus holding the load



suspended. By slightly pressing down the lever, C, the hook readily drops away from the ratchet, thus lowering the axle or other object supported.

Patented through the Scientific American Patent Agency, June 16, 1874. For further particulars regarding purchase of State and county rights, address (during next two months the inventor, Mr. James S. Rowland, Cambridge, Ohio.